CLAIMS

1. Signal processing method using a MAP (Maximum A Posteriori) type algorithm to determine a likelihood ratio Λ_k^X of a set of states X of a lattice at instant k, each of the said states being associated with at least one intermediate variable, belonging to the group including a so-called "forward" variable and a so-called "backward" variable, propagated by the said MAP algorithm and calculated recursively, in a direct direction and in an indirect direction respectively at the said instant k with respect to the said lattice,
characterised in that it includes a step for reducing the number of states selected by the said MAP type algorithm so as to calculate the said likelihood ratio,
and in that for at least one determined value is assigned to the corresponding said forward and / or backward variable, so as to calculate an approximate likelihood ratio, at least for some non-selected states.

2. Method according to claim 1, characterised in that at a given instant K, the said at least one determined value a(k) assigned to the said forward variable is such that $0 \le a(k) \le \underset{i \in M_k^f}{Min}(\alpha_i^k)$, and / or the said at least one determined value b(k) assigned to the said backward variable is such that $0 \le b(k) \le \underset{i \in M_k^b}{Min}(\beta_i^k)$, where M_k^f and M_k^b represent a set of the said states selected in the said direct direction and in the said

indirect direction respectively at the said instant k, and where α_i^k and β_i^k represent the said forward and backward variables respectively at the said instant k.

3. Method according to claim 2, characterised in that at a given instant k, the said determined value a(k) and / or b(k) is unique and is assigned to at least one forward variable α_i^k and / or backward variable β_i^k.

4. Method according to any of claims 1 to 3, characterised in that a constant value is assigned to the said forward and backward variables respectively, such that the said MAP type algorithm is a single-directional direct or indirect type algorithm respectively.

5. Method according to any of claims 1 to 4, characterised in that the said step to reduce the number of states uses a "breadth-first" type lattice search algorithm.

6. Method according to claim 5, characterised in that the said "breadth-first" type algorithm is an M type algorithm.

7. Method according to claim 5, characterised in that the said "breadth-first" type algorithm is a T type algorithm using at least one threshold.

8. Method according to claim 7, characterised in that the said at least one threshold is variable as a function of the said instant k.

9. Method according to claim 8, characterised in that a predetermined value is assigned to the said variable threshold for each instant k.

10. Method according to claim 8, characterised in that for each instant k, the value of the said variable threshold is determined by the use of an adaptive algorithm.

11. Method according to claim 10, characterised in that the said adaptive algorithm is a gradient type algorithm.

12. Method according to any of claims 10 and 11, characterised in that since the said lattice comprises a plurality of nodes each associated with one of the said states and at a given instant k, the value of the said variable threshold T at an instant (k+1) is determined by the following equation:

$$T(k+1) = T(k) - \mu(M(k) - M_c)$$

where T(k) represents the value of the said variable threshold at the said instant k,
M_c is the target number of propagated nodes in the said lattice,
M(k) is the number of propagated nodes in the said lattice at instant k,
and μ is a positive constant representing a learning gain.

13. Method according to any of claims 11 and 12, characterised in that the said adaptive algorithm is a gradient type algorithm with variable pitch.

14. Method according to any of claims 12 and 13, characterised in that the said learning gain μ is a function of the said instant k.

15. Method according to any of claims 2 to 14, characterised in that since the said "breadth-first" type algorithm is an M type algorithm, the said determined values a(k) and / or b(k) assigned to the said "forward" and / or "backward" variables respectively, at a given instant k are given by the following equations:

$$a(k) = \underset{i \in M_k^f}{Min}\,(a_i^k) - c_f$$

$$b(k) = \underset{i \in M_k^b}{Min}\,(\beta_i^k) - c_b$$

where c_f and c_b are two positive constants.

16. Method according to any of claims 2 to 14, characterised in that since the said "breadth-first" type algorithm is a T type algorithm, the said determined values a(k) and / or b(k) assigned to the said forward and / or backward variables at a given instant k respectively, are given by the following equations:

$$a(k) = T^f(k) - c_f$$

$$b(k) = T^b(k) - c_b$$

where c_f and c_b are two positive constants, and where $T^f(k)$ and $T^b(k)$ denote the value of the said variable threshold at said instant k in the said direct direction and in the said indirect direction respectively.

17. Method according to any of claims 1 to 16, characterised in that the said MAP type algorithm belongs to the group comprising:

- MAP type algorithms;
- Log-MAP type algorithms;
- Max-Log-MAP type algorithms.

18. Method according to any of claims 4 to 17, characterised in that since the said MAP type algorithm is a single-directional algorithm, the said method uses a step to compare decisions made by the said single-directional algorithm with the corresponding decisions made by a Viterbi type algorithm, called Viterbi decisions.

19. Method according to claim 18, characterised in that in the case of a negative comparison for at least one of the said decisions made by the said single-directional algorithm, the said method uses a substitution step for the said Viterbi decision corresponding to the said decision made by the said single-directional algorithm, called the substituted decision.

20. Method according to claim 19, characterised in that a determined value V is assigned to the absolute value of the said likelihood ratio associated with the said substituted decision.

21. Method according to claim 20, characterised in that the said determined value V is equal to the absolute value of the average likelihood ratio of the sequence.

22. Method according to claim 18, characterised in that in the case of a negative comparison for at least one of the said decisions made by the said single-directional algorithm, the said method uses a step for weighting the said likelihood ratio associated with the said decision considered, taking account of the said Viterbi decision.

23. Method according to claim 22, characterised in that when Y is a set of states associated with a decision D_i^Y output by the said Viterbi type algorithm at instant i, and Λ_i^y represents the likelihood ratio associated with Y at instant i as calculated by the said single-directional algorithm during the said weighting step, the value of Λ_i^y is replaced by $\widetilde{\Lambda}_i^Y$ defined by $\widetilde{\Lambda}_i^Y = \Lambda_i^y + D_i^Y \times V$, where V is a determined value.

24. Method applicable, according to any of claims 1 to 23, to at least one of the domains belonging to the group comprising:

- symbol detection;
- signal coding / decoding;
- turbo-decoding;
- turbo-detection;
- source coding by quantification in lattice.

25. Communication signals receiver comprising means for implementing a MAP (Maximum A Posteriori) type algorithm to determine a likelihood ratio Λ_k^X of a set of states X of a lattice at instant k,
each of the said states being associated with at least one intermediate variable belonging to the group comprising a so-called "forward" variable and a so-called "backward" variable propagated by the said MAP algorithm and calculated recursively in a direct direction and in an indirect direction respectively at the said instant k with respect to the said lattice,

characterised in that it comprises means of reducing the number of states selected by the said MAP type algorithm in order to make a calculation of the said likelihood ratio,
and in that for at least some non-selected states, at least one determined value is assigned to the corresponding said forward variable and / or backward variable, so as to calculate an approximate likelihood ratio.